

Does Body Mass Index Influence the Outcomes of Using Magnetic Nails for Lower Extremity Lengthening in Children?

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Introduction

- Obesity may have negative effects on outcomes for various orthopedic procedures
- The purpose of this study is to assess the effect of BMI percentile on the types and rates of complications encountered during intramedullary (IM) limb lengthening in children



Methods

- Retrospective study included a total of 90 patients (100 lengthened segments)
- Normal defined as BMI percentile < 85%
- Overweight defined as BMI percentile ≥ 85%
- Average age = 14.4 years (range, 7.2–20 years)
- 100 segments (85 femora; 15 tibiae)
- All underwent IM limb lengthening

Results

- Mean follow up time = 1.7 years (range, 1–3.5 years)
- Of the 100 segments, 62 bone segments were from normal weight children and 38 bone segments were in the overweight/obese group (Table 1)
- Mean BMI percentile for normal patients was 46.1% (Figure 1)
- Mean BMI percentile for overweight patients was 91.8% (Figure 2)
- Fifty patients encountered 73 complications (Table 2):
 - 41/73 from the normal BMI percentile group
 - 32/73 from the overweight BMI percentile group

Table 1. Demographic Data. Note that groups are very similar except for BMI percentile.

| | Normal (n=62) | Overweight (n=38) | P Value |
|---|---------------|-------------------|---------|
| Mean patient age ± SD (years) | 14.3 ± 2.7 | 14.5 ± 3.2 | 0.7896 |
| Mean follow-up ± SD (years) | 1.6 ± 0.8 | 1.7 ± 0.9 | 0.6755 |
| Mean (BMI) percentile % ± SD | 46.1 ± 25.4 | 91.8 ± 4.6 | <0.0001 |
| # Tibia with PRECICE (%) | 10 (16.1%) | 5 (13.2%) | 0.6949 |
| # Femur with PRECICE (%) | 44 (71.0%) | 27 (71.1%) | 0.9915 |
| # Femur with ISKD (%) | 8 (12.9%) | 6 (15.7%) | 0.6964 |
| Mean consolidation index (CI) (days/cm) | 34.9 ± 16.3 | 31.6 ± 16.8 | 0.3314 |
| Mean distraction index (DI) (mm/day) | 1.5 ± 0.5 | 1.4 ± 0.5 | 0.4478 |

Table 2. Complications. The two groups did not have a statistically significant difference in the number of complications.

| | Normal (n=62) | Overweight (n=38) | P Value |
|-------------------------------|---------------|-------------------|---------|
| Patients with complications | 29 (46.8%) | 21 (55.2%) | 0.4172 |
| Total complications | 41 | 32 | – |
| Complications Breakdown (%): | | | |
| Contractures | 8 (12.9%) | 12 (31.6%) | 0.1108 |
| Delayed union | 12 (19.4%) | 7 (18.4%) | 0.3093 |
| Subluxation | 6 (8.8%) | 1 (2.6%) | 0.0894 |
| Rod fracture/failure | 2 (3.2%) | 4 (10.5%) | 0.2647 |
| Nerve compression | 3 (4.8%) | 2 (5.3%) | 0.8347 |
| Lengthening goal not achieved | 3 (4.8%) | 1 (2.6%) | 0.4162 |
| Malunion/Nonunion | 1 (1.6%) | 2 (5.3%) | 0.4507 |
| Pre-consolidation | 1 (1.6%) | 1 (2.6%) | 0.8928 |
| Screw failure/revision | 2 (3.2%) | 0 (0%) | 0.1984 |
| Infection | 2 (3.2%) | 0 (0%) | 0.1984 |
| Other | 1 (1.6%) | 2 (5.3%) | 0.0678 |

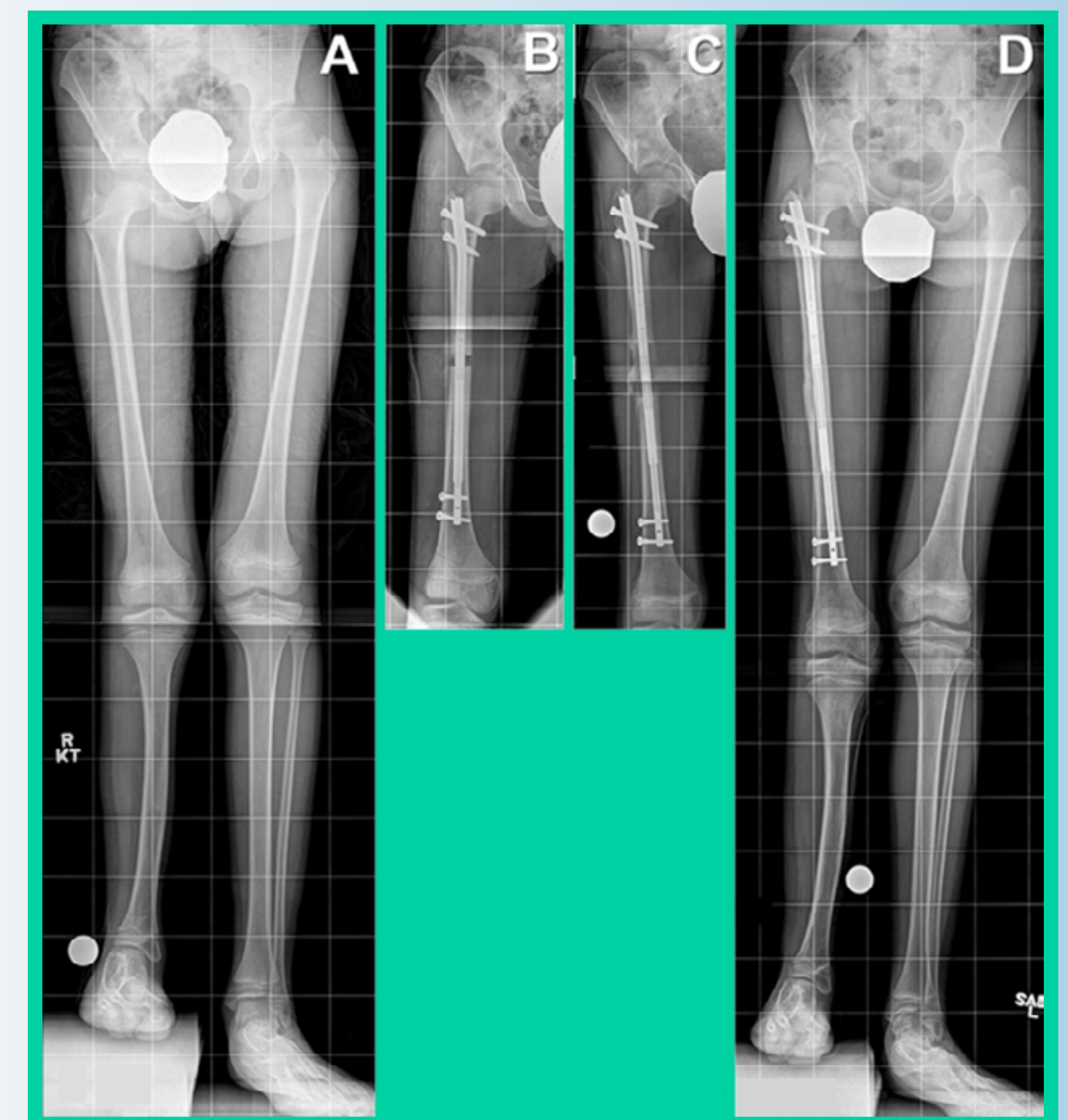


Figure 1. Eleven-year-old boy with congenital femoral deficiency and fibular hemimelia. Right limb is 5.5 cm shorter than the left limb. BMI percentile is within normal range. **A**, Preoperative AP view full length standing radiograph. **B**, Immediate postoperative AP view radiograph of the right femur. **C**, AP view radiograph shows distraction is completed. **D**, AP view full length standing radiograph shows the fully consolidated femur with the lengthening goal achieved. Tibia will be lengthened in subsequent treatment.

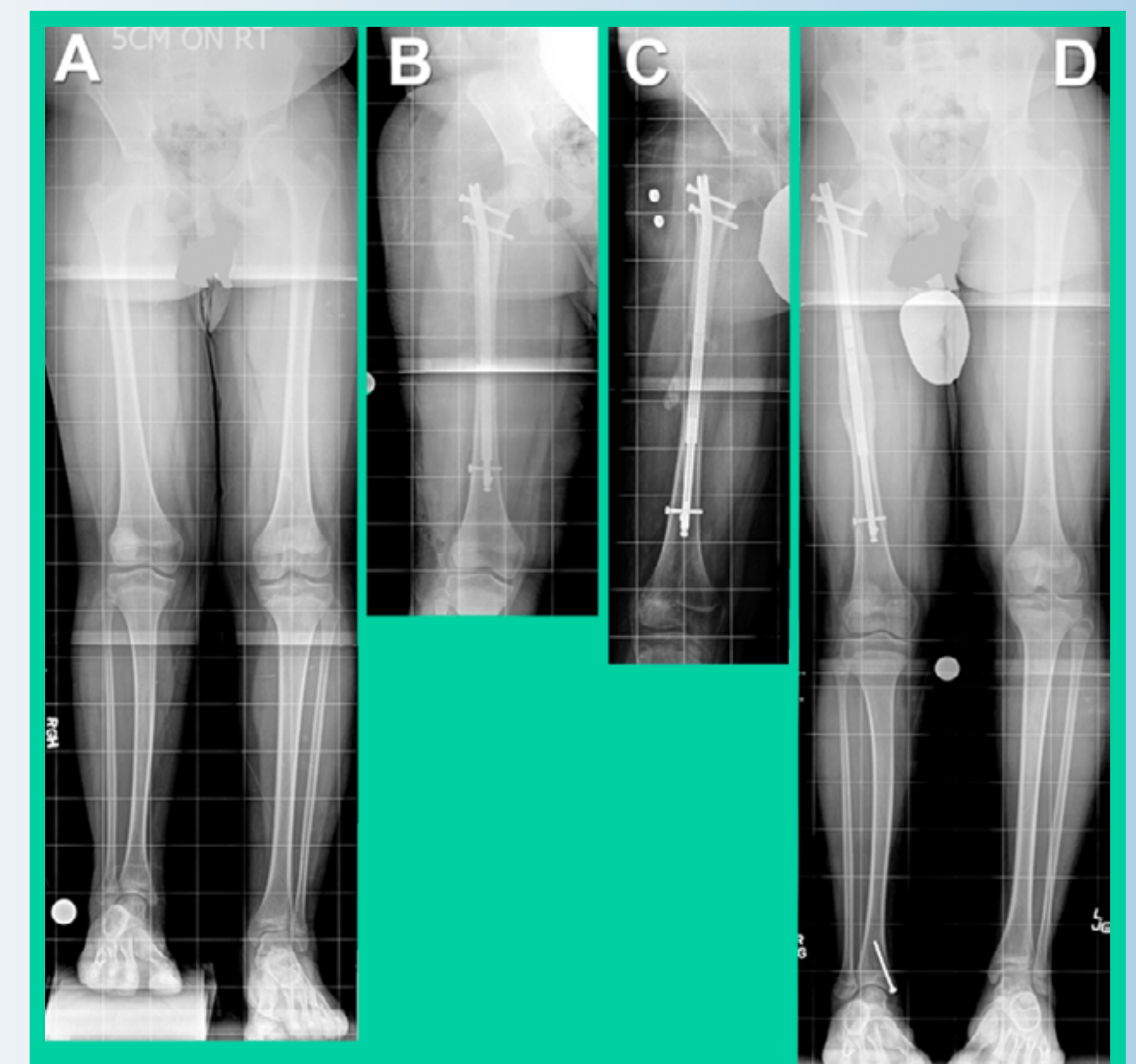


Figure 2. Twelve-year-old boy diagnosed with congenital femoral deficiency and fibular hemimelia. Right limb is 5 cm shorter than the left limb. BMI percentile is 98%. **A**, Preoperative AP view full length standing radiograph. **B**, Immediate postoperative AP view radiograph of the right femur. **C**, AP view radiograph shows distraction is completed. **D**, AP view full length standing radiograph shows the fully consolidated femur. Lengthening goal was achieved.

Conclusion

- In this cohort of patients, there was no significant difference between normal and overweight pediatric patients in terms of complications and healing rates after IM limb lengthening surgery.
- Despite these results, surgeons must assess each patient individually to determine possible surgical risk.
- Future studies on larger cohorts with longer follow-up periods are required to confirm these results.